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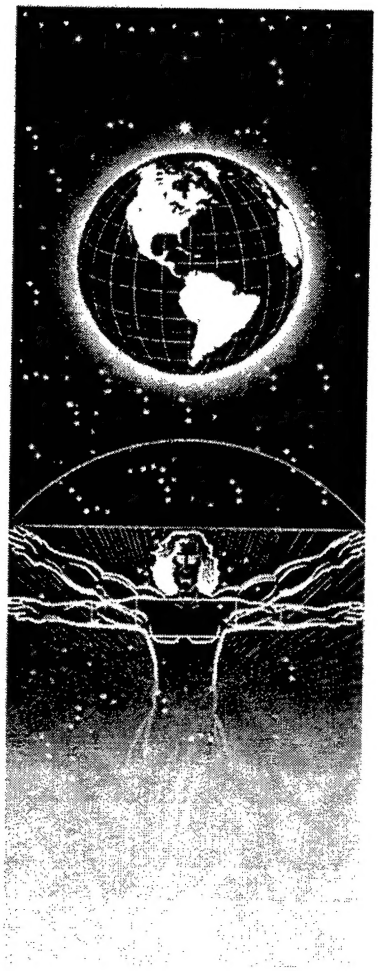

UNITED STATES AIR FORCE RESEARCH LABORATORY

Boom Analysis Monitor (BAM) System: User Manual and System Description

Steven K. Brownell

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1551 Forbes Street
Fredericksburg VA 22405

March 1999

Final Report for the Period June 1998 to March 1999

Human Effectiveness Directorate
Crew System Interface Division
2610 Seventh Street
Wright-Patterson AFB OH 45433-7901

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FOR THE COMMANDER

MARIS M. VIKMANIS
Chief, Crew System Interface Division
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The sonic Boom Analysis and Measurement (BAM) system is portable, user configurable and is rapidly deployable.The BAM system user's manual is designed to familiarize the user by providing concise steps so that the system can be properly installed and operated. The manual also contains information that will allow the operator to confirm that the system is functioning properly before deployment and contains some basic field-level maintenance information. The system has been developed for and with the assistance of the Air Force Research Laboratory at Wright-Patterson AFB, OH. The BAM system has been designed to detect sonic booms. The system was developed to have superior performance to the existing Boom Event Analyzer Recorder (BEAR) system.

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PREFACE

The Boom Analysis and Measurement (BAM) system was developed under Air Force contract F41624-98-C-9005 during the period from June 1998 to March 1999. The work was conducted under Program Element 63723F, Workunit 2103C1B2, under the direction of the Aural Displays and Bioacoustics Branch of the Air Force Research Laboratory, Wright-Patterson AFB OH. Robert A. Lee was the project monitor.

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1.0 Purpose

The sonic Boom Analysis and Measurement (BAM) system user's manual is designed to familiarize the user by providing concise steps so that the system can be properly installed and operated. This manual also contains information that will allow the operator to confirm that the system is functioning properly before deployment and contains some basic field-level maintenance information.

This system has been developed for and with the assistance of the Armstrong Laboratory at Wright-Patterson Air Force Base, Ohio. The BAM system has been designed to detect sonic booms. The system was developed to have superior performance to the existing Boom Event Analyzer Recorder (BEAR) system.

2.0 Overview

The Boom Analysis and Measurement (BAM) system overview is divided into a system overview and an operations overview. The system overview introduces the different main components of the system. The operations overview gives an overview of the functions each portion of the system can perform.

2.1 System Overview

The BAM system is portable, user configurable, and is rapidly deployable. BAM consists of two major components; the sensor and the monitoring station computer. An example deployment configuration is shown in Figure 1.

The sensor automatically detects sonic booms and provides measurements of these booms. The sensor is internally battery powered for remote operation. External 12 volt DC power may also be used in the optional power port. The sensor is placed where the booms are to be measured and uses a geophone and a hydrophone to determine the occurrence of a boom. Reports of detected activity are sent to the monitoring station where the data is stored in a database.

The monitoring station consists of a Windows 95 computer running the BAM User Software. The PU is used to process the reports sent by the sensors and the computer is used to program the sensors and display the results for the operator. Boom reports and configurations can also be saved onto floppy disks or printed by the computer.

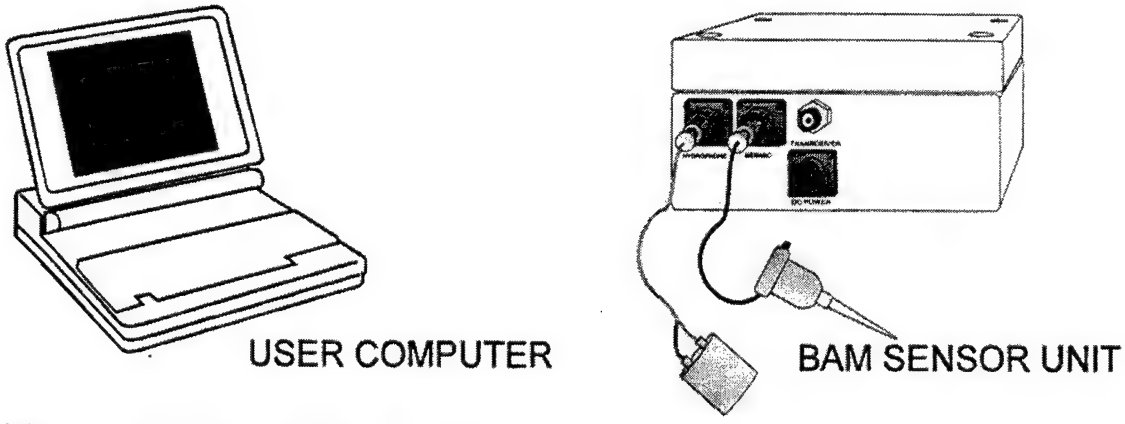

Figure 1 BAM System Block Diagram

2.2 Operations Overview

The operation of the BAM system is controlled by the monitoring station computer. The sensor operates autonomously, affected only via commands from the monitoring station.

The monitoring station is the receive node of all data collected by the sensor and provides for the display and archiving of data. The computer also provides for reprogramming sensor operations. This is the only external control available for the sensor. There are a number of sensor data processing thresholds and other options available. These are accessed via the BAM software for appropriate command generation.

2.3 System Communication Overview

All BAM communications sequences are begun by the computer. The user may either request a data download or may send a reprogramming message to the sensor.

When requesting a data upload, the sensor will respond with either a summary or a detailed message as requested. When the command transmit is successful, the sensor will pass a data message back to the BAM user software. After the user has finished with the data in the sensor, he needs to send a purge command to the sensor to free that memory for use on other events.

The user may also send a reprogramming message to the sensor. If this is successful, the sensor will transmit back an acknowledgment. This informs the software and the user that the transmit was successful.

3.0 System Components

The BAM system is comprised of two main components; the sensor and the monitoring station computer. Each of these components are subsystems and are described below.

3.1 Sensor

The sensor is that portion of the BAM system which performs the remote sensing of sonic booms and reports information back to the computer. Once this unit is placed at the site of interest and activated it does not require the computer until the user decides to download the data or reprogram the sensor. The sensor consists of the following components: the sensor electronics module, the hydrophone, and the geophone as shown in Figure 2.

WARNING: The sensor has internal batteries that may be replaced as needed. None of the other components inside of the sensor are user serviceable.

3.1.1 Electronics Module

The sensor module is the portion of the sensor that contains the electronics and internal battery. The electronics receive data from the sensor transducers and analyze these inputs to automatically detect and record the waveforms and parameters of sonic booms. It also contains the VHF transceiver which will allow it to communicate with the computer over the VHF link in the future.

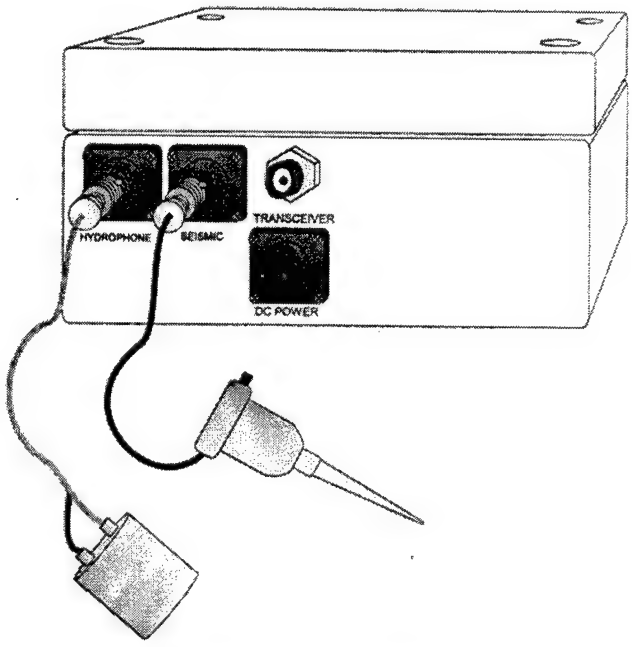

Figure 2 BAM Sensor and Transducer Connections

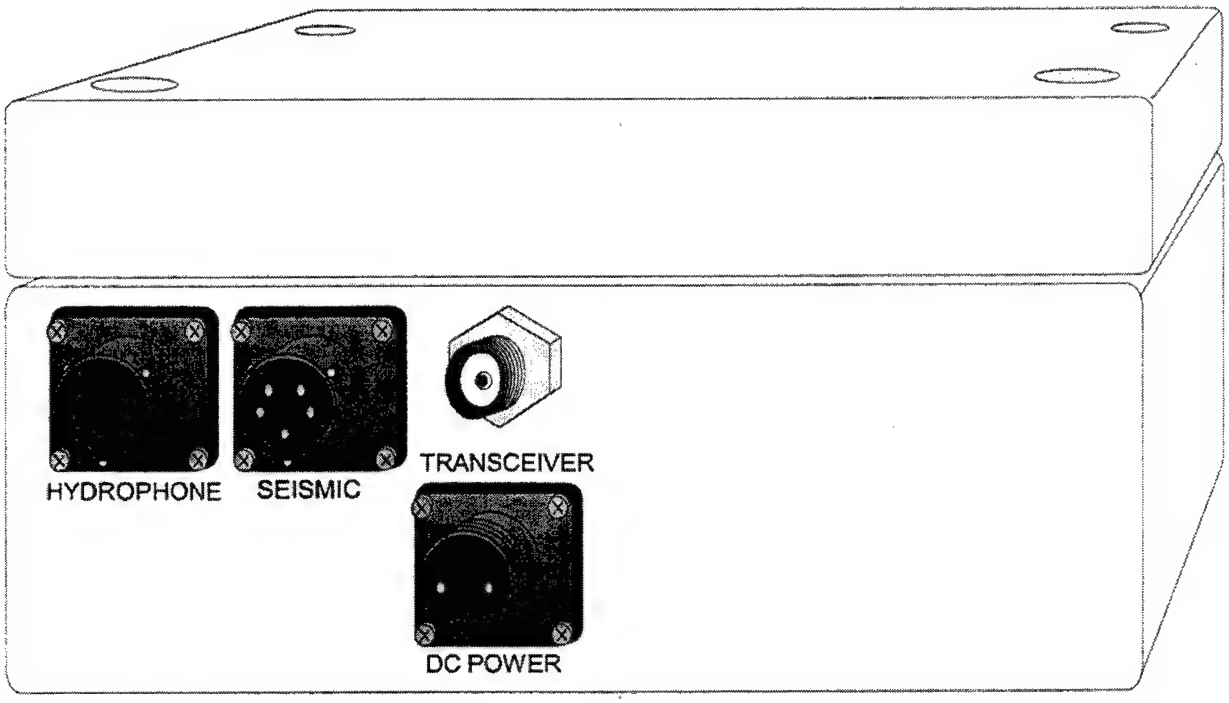

Figure 3 BAM Sensor Connections

The sensor electronics module has four connectors. These connectors are labeled HYDROPHONE, SEISMIC, TRANSCEIVER, and DC POWER as shown in Figure 3. Each of these devices are summarized next.

3.1.2 Hydrophone

The hydrophone is the primary transducer of the BAM system. Generally speaking a hydrophone is an instrument for listening to sound transmitted through water. However, BAM uses the hydrophone for its low frequency performance in air (as well as its water resistance). The BAM hydrophone has an attached cable that uniquely mates to the labeled connector on the electronics module.

3.1.3 Seismic

When the pressure wave from a sonic boom impacts the ground or other fixed object, that object is vibrated. The purpose of the seismic transducer is to measure the vibration in the ground caused by this pressure wave. The seismic transducer

is called a geophone. The BAM geophone has an attached cable that uniquely mates to the labeled connector on the electronics module.

3.1.4 Transceiver

The plan for BAM includes remote telemetry from a set of BAM sensors to the monitoring station using a VHF transceiver. This sensor has the transmitter and receiver for the transceiver. However, the BAM sensor does not currently have the software for the VHF communications. In the future, the transceiver antenna will be connected to the labeled TNC connector.

3.1.5 Power

The internal battery pack supplies power to the sensor electronics. It has the capacity to supply DC power to the module for up to two days under normal operating conditions. The sensor may also be operated from an external 12 volt DC battery pack or other power source using the connector provided. The internal batteries are isolated from the external source, but it is safer to remove the internal batteries before using external power.

WARNING: If you are using external 12 VDC power, remove the internal batteries before applying power to the external power connector.

3.2 Monitoring Unit

The BAM monitoring unit is a computer running Windows 95. The BAM computer with the rest of the system is shown in Figure 1.

3.2.1 Computer

The BAM computer is a user supplied computer which runs Windows 95 (Version 4 or later) and the BAM user software. The computer is used to display report data and allows the operator to configure the sensor as desired. The computer also gives the user the capability to store data onto a floppy disk and

print reports. All of the computer software features are described more fully in Section 6.

3.2.2 Serial Cable

Also provided is a serial cable that connects between the computer and the BAM sensor. This cable connects to the computer RS-232 serial port and to the sensor seismic port. The BAM software uses this interface to send commands and reprogramming messages to the sensor and to upload sensor data.

4.0 Sensor Setup

The sensor is designed to be hand carried to the site of interest, rapidly assembled into its operating configuration, and activated.

4.1 Site Selection

The first step in deploying the sensor is to ensure that the sensor is properly placed. The sensor must be placed so that the amount of wind blowing on the hydrophone is minimized. The ground around the sensor must be soft enough to allow the geophone to be inserted into the soil. If the ground is frozen, pouring water on the ground to soften the soil is fine, because when the ground refreezes it enhances the coupling between the sensor and the ground. Figure 2 displays the sensor with the hydrophone and geophone attached.

4.2 Deployment

Once the sensor has been carried to the deployment location, it must be assembled. The transceiver connector is currently unused. The geophone provided is installed by stomping the geophone stake into the ground and connecting its cable to the SEISMIC connector. The hydrophone is installed by placing it and attaching its cable to the HYDROPHONE connector. Finally, the sensor power is applied. This is done by either inserting the internal battery pack or by applying external 12 volts DC to the DC Power connector.

When power is applied, the sensor automatically performs a Built In Test and Evaluation (BITE) of itself to make sure it is ready to be deployed. When BITE successfully completes, the sensor is ready to be reconfigured by the system user or it is ready to make sonic boom measurements.

4.3 Sensor Configuration

Once the sensor power has been turned on and the transducers have been connected, the BAM sensor is ready to collect sonic boom data. However, some of the parameters in the detection criteria may be modified using the computer software. The user software is covered more fully in Section 6.

All of the deployment steps are summarized in the flow diagram shown in Figure 4. These steps depict the normal flow whenever the sensor is used, whether for a system checkout, for a local test of the BAM system, or for an actual deployment.

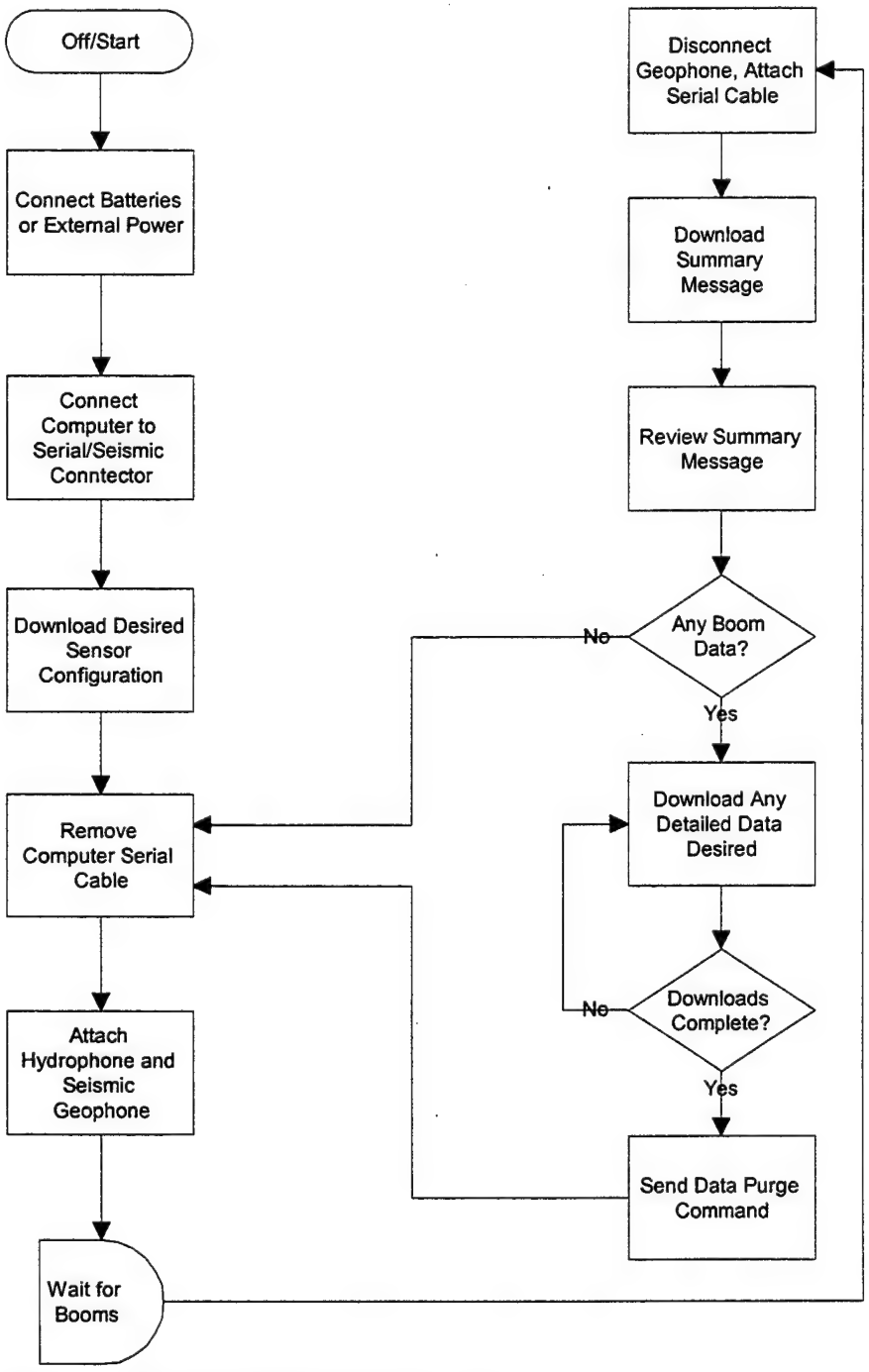

Figure 4 BAM Installation Flow Chart

5.0 System Operation

After the deployment of the sensor, the operation of the system involves operating the BAM user software, receiving messages from the sensor, and system maintenance.

Before covering the different menu items available in the BAM user interface, the user needs to understand the sensor configuration.

5.1 Sensor Configuration

The window used to edit the sensor configuration is shown in Figure 5. The user may customize the performance of the sensor for each unique situation by changing these parameters. Each is described below.

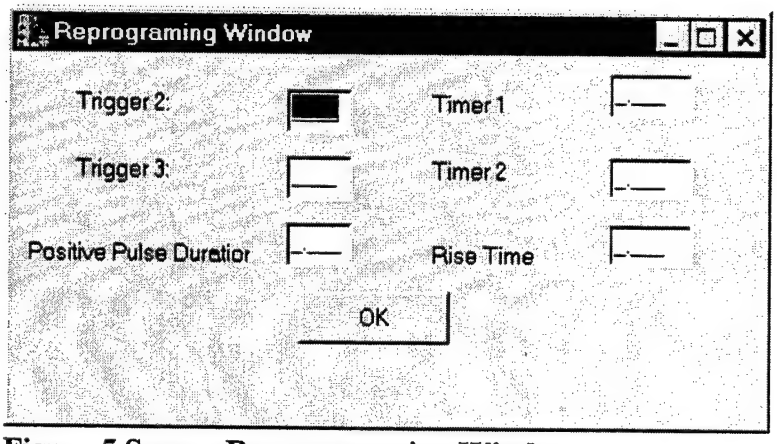

Figure 5 Sensor Reprogramming Window

These parameters are the same as those used in previous generations of the BEAR event evaluation criteria. The graphical representation for these levels and time interfaces is shown in Figure 6 on the next page.

5.1.1 Trigger 2

The trigger 2 level represents the smallest signal from the hydrophone channel that is detected by the sensor. This value is also used to calculate the value of the timers, pulse duration, and rise time.

This trigger level may be any value between 0 and 4095. A typical value for trigger 2 is 100.

5.1.2 Trigger 3

The trigger 3 level represents the smallest signal required to declare an event. This value is also used to calculate the value of the timers, pulse duration, and rise time.

This trigger level may be any value between 0 and 4095. A typical value for trigger 3 is 200.

5.1.3 Positive Pulse Duration

The positive pulse duration is the time measured from when the signal is at its peak until when it crosses the minimum signal level (trigger 2). Hydrophone voltages must rise above trigger 2 for this long to be considered to be declared events.

This duration may be any value between 0.001 and 2.5 seconds. A typical value for this duration is 0.001 seconds.

5.1.4 Timer 1

The timer 1 value is the maximum event duration. Events that otherwise satisfy all of the event criteria will never exceed this maximum duration.

This duration may be any value between 0.001 and 2.5 seconds. A typical value for this duration is 2.500 seconds.

5.1.5 Timer 2

The timer 2 value is the amount of additional sample time that is included at the end of each event. Events that satisfy all of the event criteria will always have a minimum duration of "timer 2" seconds.

This duration may be any value between 0.001 and 2.5 seconds. A typical value for this duration is 1.000 second .

5.1.6 Rise Time

The rise time is that interval between when the signal level exceeds trigger 2 and when the first peak is achieved. So, this value limits waveforms to impulsive events.

This time duration may be any value between 0.001 and 2.5 seconds. A typical value for this duration is 0.500 seconds.

5.2 Sensor Initialization

Now that the sensor configuration has been reviewed, we can review the operation of the sensor system. The sensor has a default configuration that matches the typical values listed above. If the user needs to change these parameters, he must load this new configuration into the sensor each time that the sensor power is turned on. The sensor does not have any static memory to hold data through a power outage. This data must be loaded using the BAM software described in Section 6.

WARNING: The sensor has a default configuration that is used in the sensor each time it is turned on. If another configuration is needed, it must be downloaded to the sensor each time that the sensor power is turned on.

5.3 Sensor Data

Once the sensor has been properly installed, the proper reprogramming data has been sent to the sensor, and the computer has been disconnected, then the sensor proceeds to collect sonic boom data.

Once the sensor has collected boom data, it is downloaded to the computer using the serial cable. First the user needs to download and view a summary report such as the one shown in Figure 6. If any of the events shown in the summary message are of particular interest, and the user wants to save the sampled waveform from the sensor, then he needs to download the detailed event data. Having done that, he may review the data as shown in Figure 7, or may open the data file with another analysis program.

After all of the sensor data has been downloaded, the sensor memory needs to be purged so that the sensor may have the maximum storage available for all future sonic boom events.

fSummaryPage

Event Number	Max	Min	Seismic	Duration	Time	PosPul	NegPul	Risetime
0	1044	-243	208	8000	Fri Mar 05 20:35:07 1999	18	9	212
1	1119	-464	202	8000	Fri Mar 05 20:35:09 1999	13	3	198
2	413	-450	209	8000	Fri Mar 05 20:35:11 1999	82	19	196
3	1248	-884	189	8000	Fri Mar 05 20:38:51 1999	27	31	218
4	234	-263	462	8000	Fri Mar 05 20:38:55 1999	21	46	233
5	314	-435	249	8000	Sat Mar 06 14:55:12 1999	10	9	295
6	923	-264	222	8000	Sat Mar 06 14:55:24 1999	21	3	198
7	615	-969	271	8000	Sat Mar 06 19:23:47 1999	20	42	279
8	279	-499	452	8000	Sat Mar 06 20:06:44 1999	51	10	1274

Figure 6 BAM Data Summary

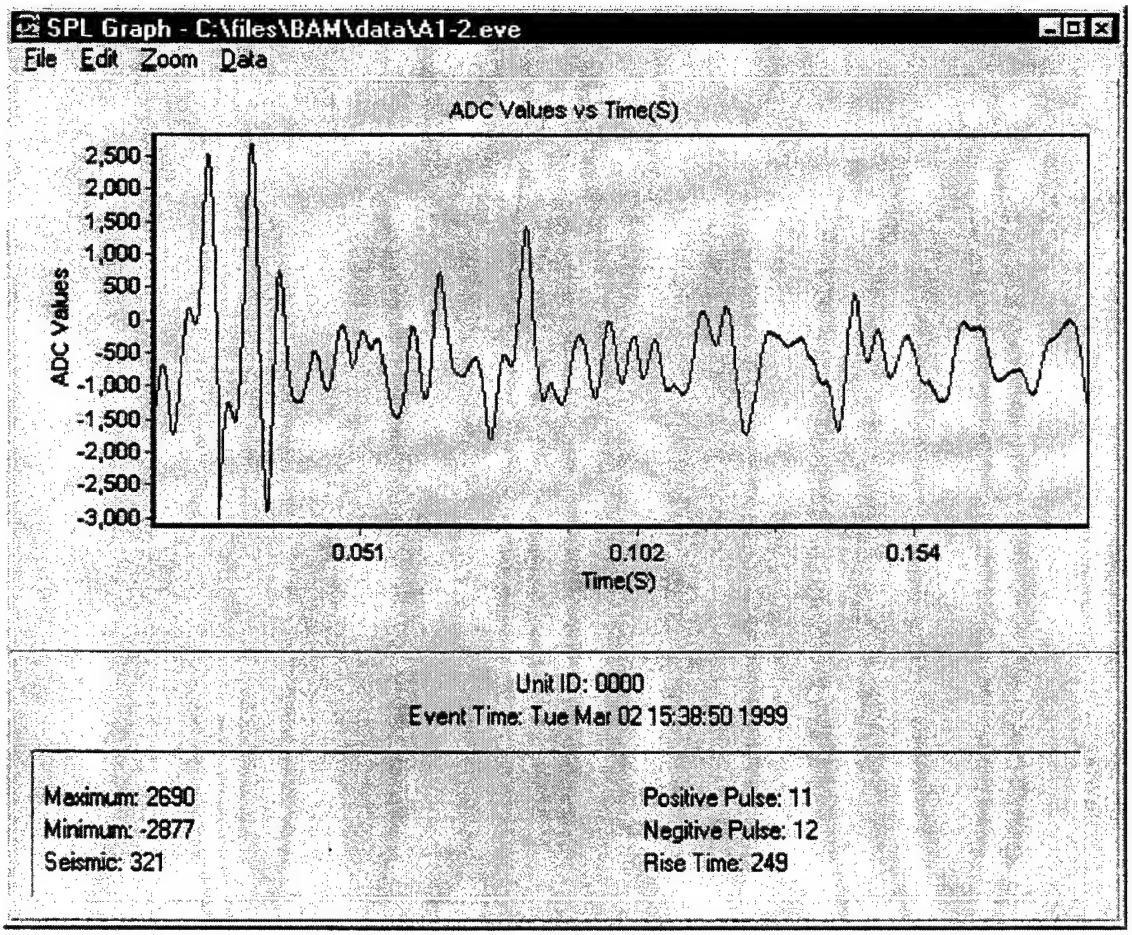

Figure 7 BAM Sensor Detailed Report

6.0 BAM Software

The BAM software was designed to ensure that the system could be monitored by an operator with a minimal amount of training. The BAM software is an application running under the Windows 95 (Version 4.0) operating system. The use of the software and this user guide assumes that the user understands Windows 95. This interface includes normal conventions for opening and closing windows, scrolling through window list boxes, minimizing and maximizing the window, printing, and context sensitive help.

WARNING: The time clock of the computer needs to be set to the correct date, time, and time zone BEFORE the BAM user software is started. In particular, changing the computer time zone while the software is running will cause the sensor to report erroneous times and on an incorrect periodic interval.

When the application is launched, a window similar to the one shown in Figure 8 will appear. This window displays the menu and the current date and time for this computer. Subsequent paragraphs will describe all of the BAM software menu items. The main menu offers File, Serial, and Help menu items.

CRITICAL WARNING: Only one copy of BAM user software can be run at a time on the same computer. Multiple copies will create resource conflicts while the software unsuccessfully attempts to share the limited communications port.

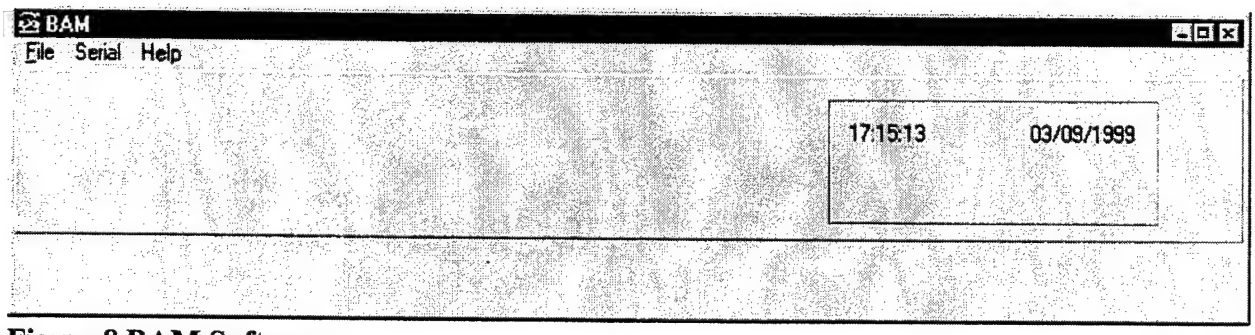

Figure 8 BAM Software

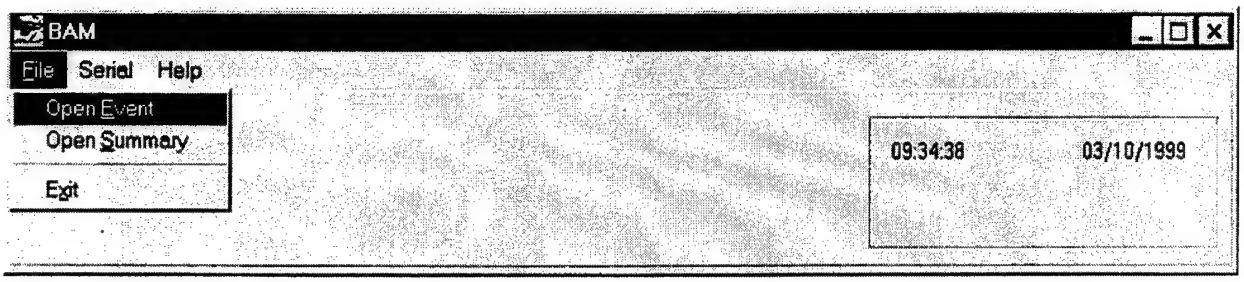

Figure 9 BAM File Menu Items

6.1 File

The file type of window functions are described below. This menu offers the following menu items: Open Event, Open Summary, and Exit.

6.1.1 Open Event

This menu selection opens an existing event data file. This file has already been uploaded from the sensor into a file on the computer. When selected, the user is given a file Open window where he needs to select the event file (*.eve) to view. Upon opening, the software creates a graph of the file data. The graph has time along the x-axis and Analog to Digital Converter (ADC) values along the y-axis. An example is shown in Figure 10.

The summary data for the graph is shown at the bottom of the window. This includes the maximum and minimum ADC values for the event, the positive and negative pulse durations (in samples), the overall rise time of the event (in milliseconds), and the seismic value recorded (in ADC counts).

Once the data graph has been opened, the user has another menu of the graphical controls for the data display window. The available menu selections are File, Edit, Zoom, and Data.

6.1.1.1 Event Graph, File, Print

The file menu has the following two choices: Print, and Exit. Each of these is reviewed next.

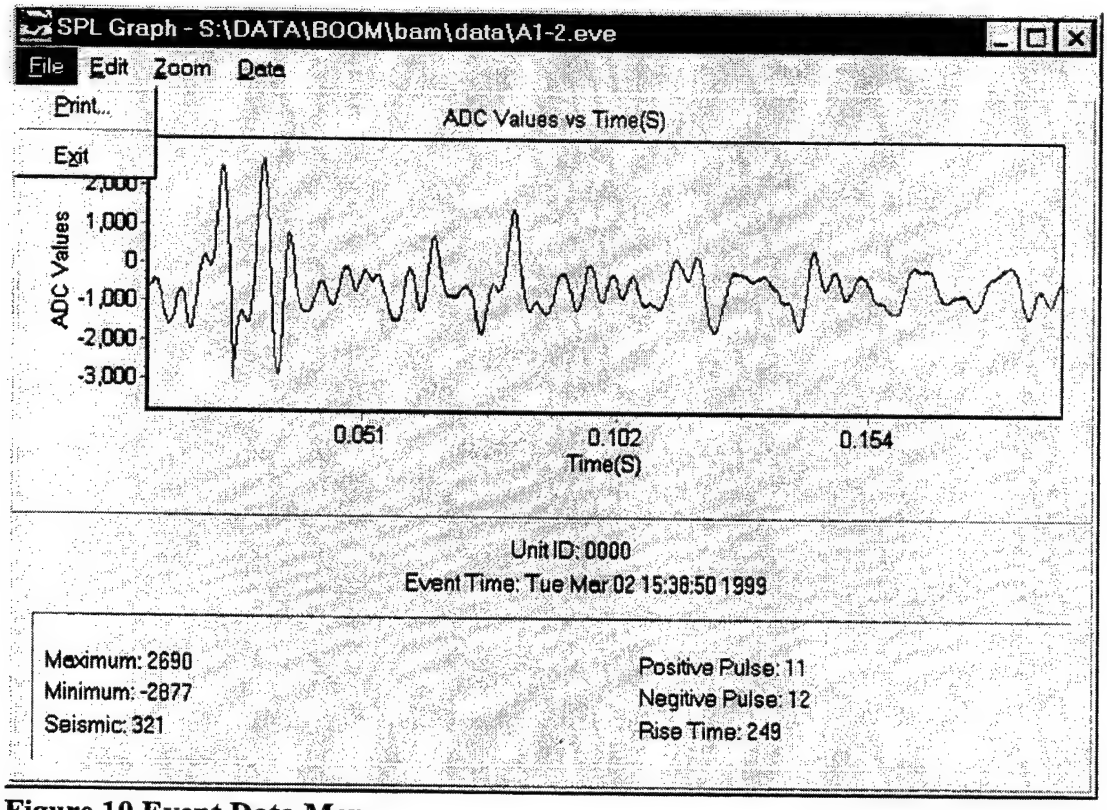

Figure 10 Event Data Menu

The File, Print menu item opens the Microsoft Windows standard print window. This allows the user to select which printer to use, printer properties, and the number of copies desired. Simply select OK to print the graph view.

6.1.1.2 Event Graph, File, Exit

The File, Exit file menu item closes the graph view, and returns control to the main BAM window. Once there, the user may select another event file to view, a summary file to view, or may start serial communications with the sensor.

6.1.1.3 Event Graph, Edit, Copy Image to Clipboard

The Edit menu has the following three choices: Copy Image to Clipboard, X Grid, and Y Grid. Each of these is reviewed below.

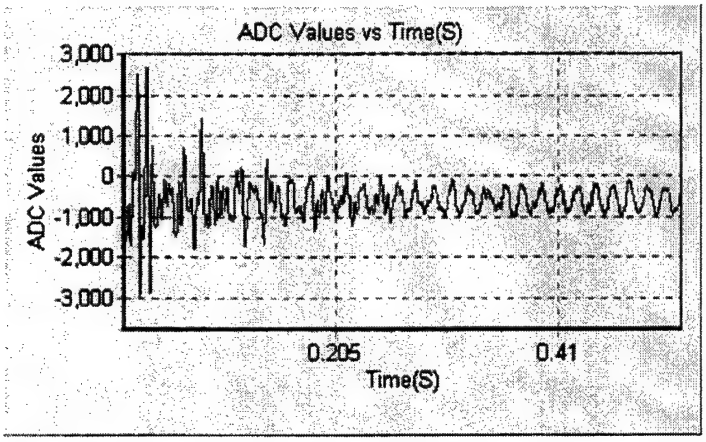

Figure 11 Example of a Pasted Clipboard Image

When the user selects Copy Image to Clipboard, the graph as shown in the BAM event data window, is copied to the Windows clipboard. Once the image has been stored to the clipboard, it may be Pasted to another Windows program such as a word processor program. Figure 11 shows such a pasted image.

6.1.1.4 Event Graph, Edit, X Grid

When the user selects X Grid, dashed grid lines are added to the image. These lines aid the user in determining at which time event waveform features occurred. Examples of these grid lines are the vertical lines in Figure 11 above.

6.1.1.5 Event Graph, Edit, Y Grid

When the user selects Y Grid, dashed grid lines are added to the image. These lines aid the user in determining the amplitude of event waveform features. Examples of these grid lines are the horizontal lines in Figure 11 above.

6.1.1.6 Event Graph, Zoom, Enable Zoom

The Zoom menu has the following two choices: Enable Zoom, and Zoom Out. Each of these is reviewed below.

When the user chooses to Enable Zoom, a check mark will appear beside the command in the menu. When enabled, the user may then drag a box in the graph view window. When the dragged box is released, the image within the box is expanded to fill the view (zoomed in). To zoom out, the

user may either right click on the image or may choose Zoom Out from the window menu.

When the user chooses to NOT Enable Zoom, the check mark will disappear from beside the command in the menu. When disabled, the user may drag the graph data within the viewable window. So if the user wants to view waveform features later in time, he clicks on the graph and drags the graph data to the left.

To summarize, if Enable Zoom is selected, dragging in the graph window causes the view to zoom. If Enable Zoom is not selected, dragging in the graph window causes the view to move.

6.1.1.7 Event Graph, Zoom, Zoom Out

When the user selects to Zoom Out, the display is reset to the initial view of the event data. This negates the effect of zooming or the effect of dragging the data window. The user may also Zoom Out by right clicking on the graph data window.

6.1.1.8 Event Graph, Data, Show Data Points

The final menu item is Data. The only menu selection under that item is Show Data Points.

When the graph is first shown, the data points are turned off. What is displayed is a series of lines between each of the ADC sample points. In a full zoom out, this shows a good representation of the sampled waveform. However, when the user zooms in on the curve to display a fewer number samples, it is helpful to see exactly where the data points were. Selecting the Show Data Points menu item turns on indicators for these points as shown in Figure 12.

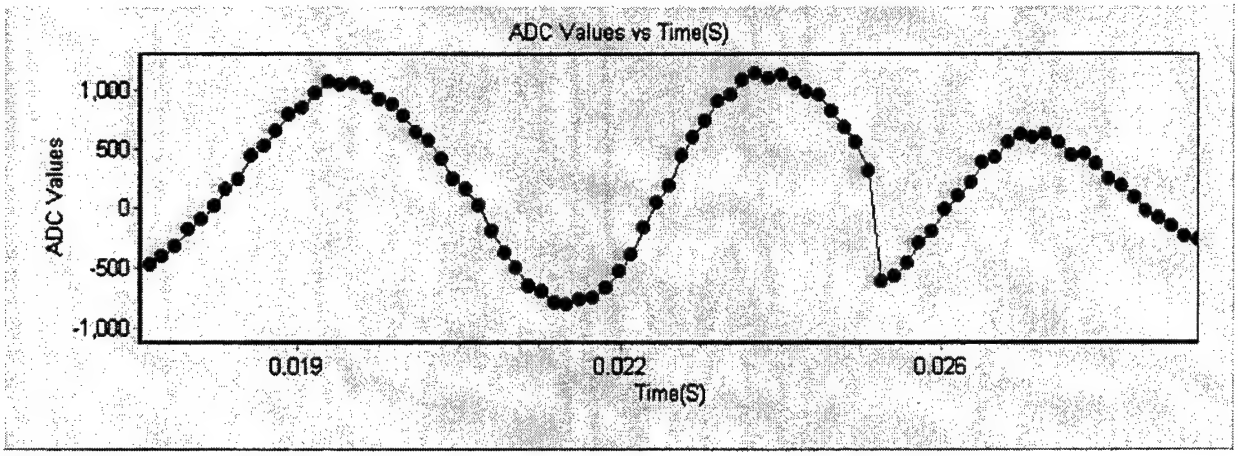

Figure 12 Example of Show Data Points

6.1.2 Open Summary

This menu selection opens an existing event summary file. This file has already been uploaded from the sensor into a file on the computer. Upon opening, the software creates a table of the summary data contained in the message. An example is shown in Figure 13. The summary data includes the event number, the maximum and minimum ADC values for the event, the seismic value recorded (in ADC samples), the duration of the event (in ADC samples), the computer date and time when the event occurred, the positive and negative pulse durations (in samples), and the overall rise time of the event (in ADC samples).

fSummaryPage

Event Number	Max	Min	Seismic	Duration	Time	PosPul	NegPul	Risetime
0	1044	-243	208	8000	Fri Mar 05 20:35:07 1999	18	9	212
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6	923	-264	222	8000	Sat Mar 06 14:55:24 1999	21	3	198
7	615	-969	271	8000	Sat Mar 06 19:23:47 1999	20	42	279
8	279	-499	452	8000	Sat Mar 06 20:06:44 1999	51	10	1274

Figure 13 Event Summary Report

6.1.3 Exit

This menu item closes any remaining files, closes the serial communications interface, and terminates the BAM program.

6.2 Serial

The Serial window functions are described below. This menu offers only the Serial Comms menu item. When the user selects Serial Comms, a serial communications window appears. An example window, with example messages displayed, is shown in Figure 14.

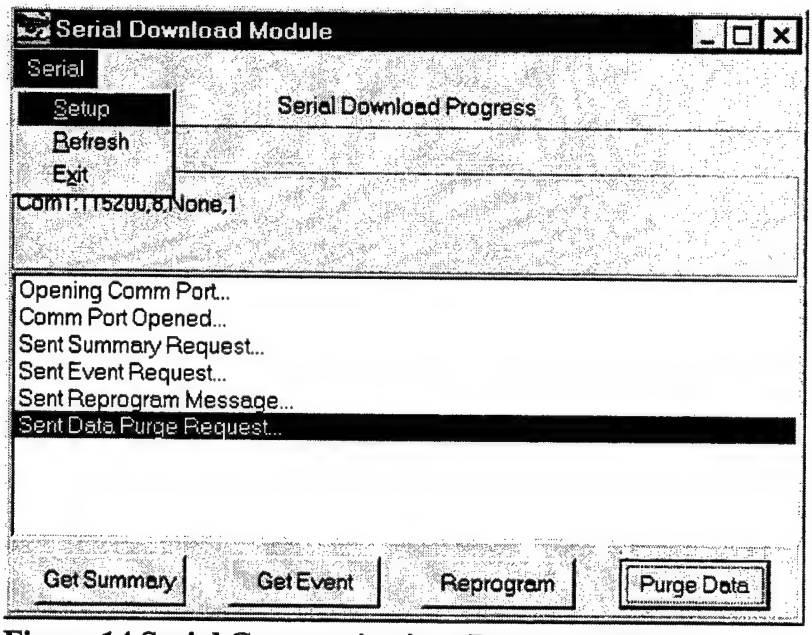

Figure 14 Serial Communications Download Window

When the serial communications window is started for the very first time, it does not have the default data for communications installed, so a warning message appears that states "Unable to Auto-Initialize the Serial Port. You will have to use Serial Setup to Initialize the Serial Port." Simply enter the data as described below in Serial Setup to prevent this warning from recurring.

The functions available in the serial communications window are described next. These include menu items of Serial Setup, Refresh, and Exit; and the function buttons at the bottom of the window to Get Summary, Get Event, Reprogram, and Purge Data.

6.2.1 Serial Setup

The BAM user must enter the serial communications parameters the first time the serial window is opened. These parameters include the Baud Rate, Data Bits, Parity, Stop Bits, and the serial Comm Port of the computer that is being used. Default values for these parameters are shown in Figure 15 are as follows. The

Baud Rate is 115200 bits per second. The Data Bits field is set to 8 bits. Parity is set to None. The Stop Bits field is set to 1. The Comm Port is set to Com1.

After entering the appropriate parameters, select OK to save the data. When the BAM software is initialized in the future, this data will be automatically used to initialize the serial communications port. If necessary, the user may reenter data for this window by selecting Setup from the serial menu.

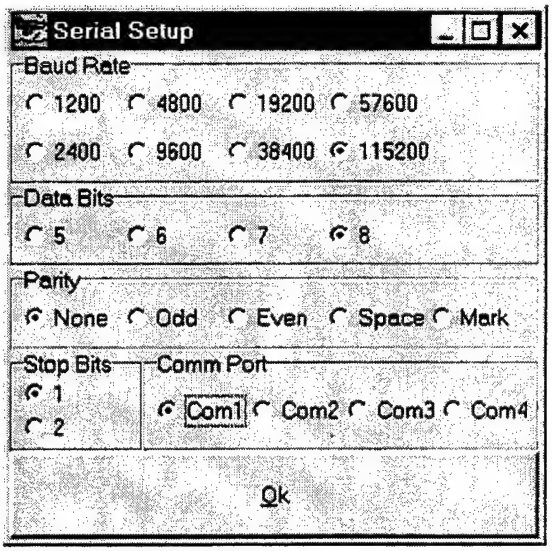

Figure 15 Default Serial Setup

NOTE: The ONLY serial communications parameter that you would possibly need to change is Comm Port. All of the other settings are correct for communications with the BAM sensor.

6.2.2 Serial Refresh

Selecting Serial Refresh clears the communications data window. This may be desired (but not required) when the user is beginning a new serial upload or download to a sensor and wants to clear data off the window.

6.2.3 Serial Exit

Selecting this menu item closes the serial port and closes the serial communications window.

NOTE: You do not need to exit the serial communications window to view a uploaded data file. You may simply click on the main BAM window, select File, and select the type of file that you wish to view (summary or event).

6.2.4 Get Summary Button

Once the serial port has been initialized (either automatically or by selecting Serial, Setup and inputting the serial communications parameters), the user may select to upload a data summary report from the attached sensor. When selected, a "Sent Summary Request" message appears in the download progress window. If the communication is successful, a message "Summary Data Message Type Successfully Received" followed by a "Data Successfully Received" message and some time information. A standard Windows File Save window is automatically opened. The user may select any subdirectory and filename that is allowed by Windows. The file extension for a summary message is a "*.sum". Once stored, these messages may be viewed from the main BAM window (under File, Open Summary). The saved file name is also displayed in the progress window.

If the summary data upload is not successful, no further information appears in the window (or an NAK or data timeout may occur), and no file save window is opened. The user may select to upload the summary data again by repeating his selection of the Get Summary button. If the upload continues to fail, the user should check that the serial cable is connected from the selected serial communications port (Com1, Com2, etc.) to the sensor. The serial cable should be connected to the SEISMIC connector of the sensor as described in Section 3.

6.2.5 Get Event Button

Once the serial port has been initialized, the user may select to upload an event data report from the attached sensor. When selected, an event number window such as that shown in Figure 16 appears. Based upon the event number as indicated in the summary report, the BAM user must specify the event number desired, then select OK. Once that has been done, a "Sent Event Request" message appears in the download progress window. If the communication is successful, a message "Event Data Message Type Successfully Received" followed by a "Data Successfully Received" message and some time information. A standard Windows File Save window is automatically opened. The user may select any subdirectory and filename that is allowed by Windows. The file extension for this event message is a "*.eve".

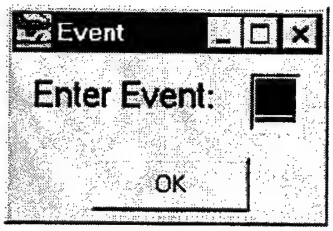

Figure 16 Event Number Window

Once stored, these messages may be viewed from the main BAM window (under File, Open Event).

WARNING: You must select a valid event number. If you select a number for an event that does not truly exist in the sensor, you will receive an erroneous data file.

If the event data upload is not successful, no further information appears in the window (or an NAK or data timeout may occur), and no file save window is opened. The user may select to upload the event data again by repeating his selection of the Get Event button and entering the desired event number. If the upload continues to fail, the user should check that the serial cable is connected from the selected serial communications port (Com1, Com2, etc.) to the sensor. The serial cable should be connected to the SEISMIC connector of the sensor as described in Section 3.

6.2.6 Reprogram Button

The Reprogram function allows the BAM user to modify the key parameters in the sonic boom detection algorithm. These parameters are fully described in Section 5.1. When the Reprogram button is selected, a window similar to the one in Figure 17 appears. This allows the user to modify the Trigger 2, Trigger 3, Timer 1, Timer 2, Positive Pulse Duration, and Rise Time parameters used in the boom detection algorithm. The user must specify all of these parameters in a reprogramming message, even if he wishes to change only one of the parameters.

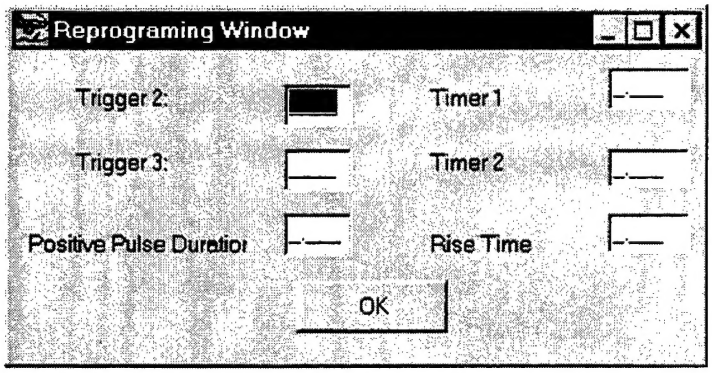

Figure 17 Reprogramming Window

Once the BAM user has selected all of the parameters and selected OK, a "Sent Reprogram Message" message appears in the download progress window. If the communication was successful, a message "Acknowledge Returned" also appears.

WARNING: The configuration that is displayed may not reflect the current configuration of the sensor.

If the reprogramming download is not successful, no further information appears in the window (or an NAK or data timeout may occur). The user may select to download the reprogramming message again by repeating his selection of the Reprogram button and the Reprogramming Window's OK button. If the download continues to fail, the user should check that the serial cable is connected from the selected serial communications port (Com1, Com2, etc.) to the sensor. The serial cable should be connected to the SEISMIC connector of the sensor as described in Section 3.

6.2.7 Purge Data Button

Once the serial port has been initialized (either automatically or by selecting Serial, Setup and inputting the serial communications parameters), the user may select to purge the data from the attached sensor. When selected, a "Sent Data Purge Request" message appears in the download progress window. If the communication was successful, a message "Acknowledge Returned"also appears.

If the purge data is not successful, no further information appears in the window (or an NAK or data timeout may occur). The user may select to purge the data again by repeating his selection of the Purge Data button. If the purge continues to fail, the user should check that the serial cable is connected from the selected serial communications port (Com1, Com2, etc.) to the sensor. The serial cable should be connected to the SEISMIC connector of the sensor as described in Section 3.

6.3 Help

The only item available under the Help menu is About. Selecting About shows information about the current version of the software. An example of this is shown in Figure 18.

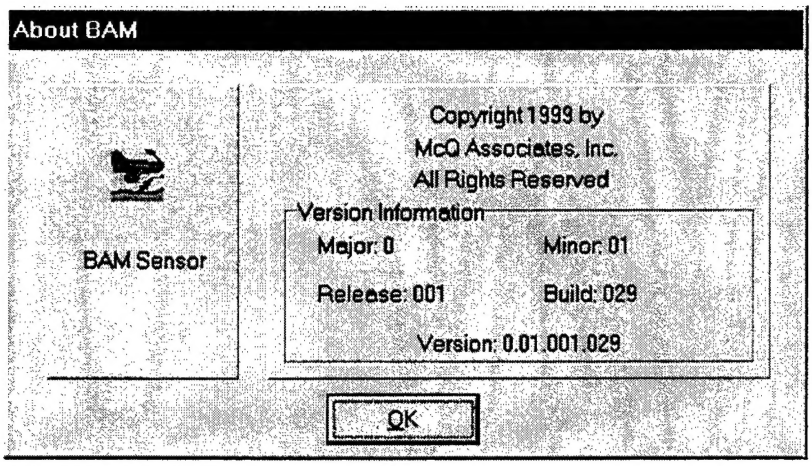

Figure 18 BAM About Window

7.0 System Shutdown Procedures

The following paragraphs describe the correct shut down procedures for the sensor and for the BAM computer software.

7.1 Sensor

The sensor may be shut down by simply turning off power to the sensor. Remember that this involves removing any external power source AND removing the sensor internal batteries.

When sensor power is removed, the sensor does not have any static data memory. The sensor will store its program, but will not store the current reprogramming configuration or any current sonic boom data.

WARNING: Download a summary report AND detailed event reports for all events of interest before removing sensor power. When the power is turned off, all of the sensor data and reprogrammed parameters are lost.

7.2 User Software

The BAM user software is a Windows 95 compliant application. As such, the software may be turned off by any of the common Windows methods. The user may select the 'x' box in the upper right hand corner of the main BAM window. Alternately, the user may select "File" from the main menu and then "Exit".

If Windows 95 is shut down, the BAM application software will also be automatically closed by the operating system.